AMENDMENTS TO THE CLAIMS

1. (Original) An image processing apparatus for converting the frequency characteristics of first color data representing a color image and outputting second color data corresponding to the first color data, comprising:

a hue region data calculation means for using the first color data to calculate first hue region data valid for a plurality of particular hue components in the color image represented by the first color data;

a frequency characteristic conversion means for converting the frequency characteristics of the first hue region data independently for each of the hue components and thereby outputting second hue region data; and

means for calculating the second color data by using the second hue region data.

2. (Original) The image processing apparatus of claim 1, wherein the first hue region data calculated by the hue region data calculation means are valid for red, green, blue, yellow, cyan, and magenta hue components of the color image represented by the first color data.

3. (Original) The image processing apparatus of claim 2, wherein the hue region data calculation means calculates chromatic component data r, g, b, y, c, m representing sizes of the red, green, blue, yellow, cyan, and magenta hue components after an achromatic component has been removed from the colors represented by the first color data, and calculates the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components by using the chromatic component data and the following formulas:

$$h1r = \min(y, m)$$
$$h1g = \min(y, c)$$
$$h1b = \min(m, c) \quad (1)$$
$$h1c = \min(g, b)$$
$$h1m = \min(r, b)$$
$$h1y = \min(r, g)$$

4. (Previously Presented) The image processing apparatus of claim 2, wherein the frequency characteristic conversion means calculates second hue region data fh1r, fh1g, fh1b, fh1y, fh1c, fh1m obtained by independently converting the frequency characteristics of the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components, and the means for calculating the second color data calculates second color data comprising color data Ro, Go, Bo representing sizes of the red, green, and blue components by using the second color region data and achromatic data α representing the achromatic component in the color image represented by the first color data, from the following formulas:

$$Ro = fh1r + fh1m + fh1y + \alpha$$
$$Go = fh1g + fh1y + fh1c + \alpha \quad (3)$$
$$Bo = fh1b + fh1c + fh1m + \alpha$$

5. (Previously Presented) The image processing apparatus of claim 1, wherein the means for calculating the second color data calculates the second color data by taking a weighted sum of the first hue region data and the second hue region data for each hue component.

6. (Previously Presented) The image processing apparatus of claim 1, further comprising means for outputting second achromatic data by converting the frequency characteristics of first achromatic data representing the achromatic component in the image represented by the first color data, wherein the means for calculating the second color data outputs the second color data by using the second hue region data and the second achromatic data.

7. (Previously Presented) The image processing apparatus of claim 1, further comprising:

means for outputting an identification code indicating information about hues of colors represented by the first color data; and

selection means for selecting, according to the identification code, second hue region data concerning hues of the colors represented by the first color data; wherein

the means for calculating the second color data outputs the second color data by using the second hue region data selected by the selection means.

8. (Previously Presented) The image processing apparatus of claim 1, further comprising:

coefficient generating means for outputting prescribed matrix coefficients set for each component of the second hue region data; and

matrix calculation means for calculating corrections for correcting the brightness and/or saturation of each hue component of the first color data by performing a matrix calculation including multiplication of the second hue region data by the matrix coefficients, the second hue region data being the data operated on; wherein

the second color data are calculated from said corrections.

9. (Original) The image processing apparatus of claim 8, wherein:

the frequency characteristic conversion means outputs second hue region data fh1r, fh1g, fh1b, fh1y, fh1c, fh1m obtained by independently converting the frequency characteristics of the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components;

the coefficient generating means outputs matrix coefficients Fij (i = 1 to 3, j = 1 to 3);

the matrix calculation means calculates corrections R1, G1, B1 for the sizes of the red, green, and blue components of the first color data from the following formula, including an achromatic data term α representing the size of the achromatic component in the color image represented by the first color data:

$$\begin{bmatrix} R1 \\ G1 \\ B1 \end{bmatrix} = (Fij) \begin{bmatrix} fh1r \\ fh1g \\ fh1b \\ fh1c \\ fh1m \\ fh1y \\ \alpha \end{bmatrix} \qquad \ldots(6)$$

10. (Original) The image processing apparatus of claim 8, further comprising means for outputting second achromatic data by converting frequency characteristics of first achromatic data representing an achromatic component in the image represented by the first color data, wherein the matrix calculation means calculates the corrections by performing a matrix calculation including the second achromatic data as the data operated on.

11. (Original) The image processing apparatus of claim 8, further comprising:

means for outputting an identification code indicating information about hues of colors represented by the first color data; and

selection means for selecting, according to the identification code, second hue region data concerning hues of the colors represented by the first color data; wherein

the matrix calculation means calculates corrections R1, G1, B1 by the following formula, using the second hue region data selected by the selection means as the terms h1p and h1q:

$$\begin{bmatrix} R1 \\ G1 \\ B1 \end{bmatrix} = (Eij) \begin{bmatrix} h1p \\ h11 \\ \alpha \end{bmatrix} \qquad \ldots(8)$$

12. (Original) The image processing apparatus of claim 8, wherein the frequency characteristic conversion means attenuates or eliminates high-frequency components of hue region data valid for a particular hue component.

13. (Original) The image processing apparatus of claim 8, wherein the frequency characteristic conversion means enhances edge components of hue region data valid for a particular hue component.

14. (Currently Amended) An image processing method for converting the frequency characteristics of first color data representing a color image and outputting second color data corresponding to the first color data, comprising:

using, hue region data calculating means, the first color data to calculate first hue region data valid for a plurality of particular hue components in the color image represented by the first color data;

converting, in a frequency characteristic conversion means, the frequency characteristics of the first hue region data independently for each of the hue components and thereby outputting second hue region data; and

calculating, in a second color data calculating means, the second color data by using the second hue region data.

15. (Original) The image processing method of claim 14, wherein the calculated first hue region data are valid for red, green, blue, yellow, cyan, and magenta hue components of the color image represented by the first color data.

16. (Original) The image processing method of claim 15, wherein the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components are calculated by calculating chromatic component data r, g, b, y, c, m representing sizes of the red, green, blue, yellow, cyan, and magenta hue components after an achromatic component has been removed from the colors represented by the first color data, and using the chromatic component data in the following formulas:

$$
\begin{aligned}
h1r &= \min(y, m) \\
h1g &= \min(y, c) \\
h1b &= \min(m, c) \qquad\qquad (1) \\
h1c &= \min(g, b) \\
h1m &= \min(r, b) \\
h1y &= \min(r, g)
\end{aligned}
$$

17. (Previously Presented) The image processing method of claim 15, wherein the second color data, comprising color data Ro, Go, Bo representing sizes of the red, green, and blue components, are calculated by calculating second hue region data fh1r, fh1g, fh1b, fh1y, fh1c, fh1m obtained by independently converting the frequency characteristics of the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components, and using the second color region data and achromatic data α representing the achromatic component in the color image represented by the first color data in the following formulas:

$$
\begin{aligned}
Ro &= fh1r + fh1m + fh1y + \alpha \\
Go &= fh1g + fh1y + fh1c + \alpha \qquad (3) \\
Bo &= fh1b + fh1c + fh1m + \alpha
\end{aligned}
$$

18. (Previously Presented) The image processing method of claim 14, wherein calculating the second color data comprises taking a weighted sum of the first hue region data and the second hue region data for each hue component.

19. (Previously Presented) The image processing method of claim 14, further comprising outputting second achromatic data by converting the frequency characteristics of first achromatic data representing the achromatic component in the image represented by the first color data, wherein calculating the second color data comprises outputting the second color data by using the second hue region data and the second achromatic data.

20. (Previously Presented) The image processing method of claim 14, further comprising:

outputting an identification code indicating information about hues of colors represented by the first color data; and

selecting, according to the identification code, second hue region data concerning hues of the colors represented by the first color data; wherein

the second color data are output by using the selected second hue region data.

21. (Previously Presented) The image processing method of claim 14, further comprising:

outputting prescribed matrix coefficients set for each component of the second hue region data; and

calculating corrections for correcting the brightness and/or saturation of each hue component of the first color data by performing a matrix calculation including multiplication of the second hue region data by the matrix coefficients, the second hue region data being the data operated on; wherein

the second color data are calculated from said corrections.

22. (Original) The image processing method of claim 21, wherein:

the second hue region data fh1r, fh1g, fh1b, fh1y, fh1c, fh1m are obtained by independently converting the frequency characteristics of the first hue region data h1r, h1g, h1b, h1y, h1c, h1m valid for the red, green, blue, yellow, cyan, and magenta hue components;

matrix coefficients Fij ($i = 1$ to 3, $j = 1$ to 3) are output; and

the corrections R1, G1, B1 for the sizes of the red, green, and blue components of the first color data are calculated from the following formula, including an achromatic data term α representing the size of the achromatic component in the color image represented by the first color data:

$$\begin{bmatrix} R1 \\ G1 \\ B1 \end{bmatrix} = (Fij) \begin{bmatrix} fh1r \\ fh1g \\ fh1b \\ fh1c \\ fh1m \\ fh1y \\ \alpha \end{bmatrix} \quad \ldots(6)$$

23. (Original) The image processing method of claim 21, further comprising outputting second achromatic data by converting frequency characteristics of first achromatic data representing an achromatic component in the image represented by the first color data, wherein the corrections are calculated by performing a matrix calculation including the second achromatic data as the data operated on.

24. (Original) The image processing method of claim 21, further comprising:

outputting an identification code indicating information about hues of colors represented by the first color data; and

selecting, according to the identification code, second hue region data concerning hues of the colors represented by the first color data; wherein

the corrections R1, G1, B1 are calculated by the following formula, using the second hue region data selected by the selection means as the terms h1p and h1q:

$$\begin{bmatrix} R1 \\ G1 \\ B1 \end{bmatrix} = (Eij) \begin{bmatrix} h1p \\ h11 \\ \alpha \end{bmatrix} \quad \ldots(8)$$

25. (Original) The image processing method of claim 21, wherein converting the frequency characteristics comprises attenuating or eliminating high-frequency components of hue region data valid for a particular hue component.

26. (Original) The image processing method of claim 21, wherein converting the frequency characteristics comprises enhancing edge components of hue region data valid for a particular hue component.